

Species definitions are very different for dolphins, humans

By Smithsonian.com, adapted by Ndewsela staff on 08.26.16

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TOP: Australian humpback dolphins, Tin Can Bay, Queensland, Australia, 2016. Wikimedia Commons. BOTTOM: David Lordkipanidze, director of the Georgian National Museum, holding a well-preserved skull from 1.8 million years ago found in the remains of a medieval hilltop city in Dmanisi, Courtesy of Getty Images.

New species of insects, worms and other creepy-crawlers are announced on a monthly basis. Similarly, just last week, two new humpback dolphin species splashed into the headlines, while in October, news broke that early humans may have included fewer species than previously thought. This raises the question: what does it take to be a distinct species?

More than 70 official species definitions exist, of which 48 are widely accepted and used by scientists. There's no hard rule that scientists must use only one definition. Some apply a handful of species definitions when approaching the topic.

"I personally go to my lab every day and use five species definitions to conduct research," says Sergios-Orestis Kolokotronis, a molecular ecologist at Fordham University, and co-author of the new dolphin study, published in *Molecular Ecology*. "And I sleep just fine amidst this uncertainty."

Species definitions do not always translate from one organism to another. Dolphins may become isolated by distance and behavior that prevents them from reproducing, but in other cases, these distinguishing markers distance and behavior do not apply. For example, bacteria reproduce asexually, without partners. Thus, the definition of what constitutes a species varies depending on whether scientists are studying dolphins, monkeys, insects, jellyfish, plants, fungi, bacteria, viruses or other organisms. And likewise, methods for investigating those species also vary.

DNA Tells A Different Story

In the case of the four dolphin species, each occupy different sections of ocean around the world. They live in the Atlantic off West Africa, in the central to western Indo-Pacific, in the eastern Indian and western Pacific, and in northern Australia.

While the humpback dolphins look quite similar, their genetics tells a different story. Researchers collected 235 tissue samples and 180 skulls throughout the animals' distribution, the biggest sample set assembled to date for the animals. The team analyzed DNA from the tissue. DNA controls how every part of an animal develops and functions. The dolphins' DNA revealed significant variations between those four populations. They also compared the skulls for structural differences.

The line between what makes a species, a sub-species and a population is a blurry one. In this case, though, the researchers are confident that the four dolphins are different enough to warrant the "species" title. The DNA turned up genetic differences distinct enough to signal a separate species, and likewise, differences in the dolphins' skulls supported the divergence.

"We can confidently say that such strong divergence means these populations are demographically and evolutionarily isolated," says Martin Mendez. Mendez is a molecular ecologist at the American Museum of Natural History and lead author of the dolphin paper.

The genetic information the team collected does not have enough detail to reveal how long ago the humpback dolphins diverged. But Mendez and his partners have found that environmental factors such as currents and temperature sometimes play a role in separating populations. Once populations have been separated, new species can eventually emerge.

Trimming The Evolutionary Tree

Dolphins, Mendez and his partners are finding, evolve relatively quickly once isolated from parent populations. New cryptic – or hidden – species have similarly turned up in waters near South America. There may very well be other species of dolphins – or any type of animal, in fact – lurking undetected within an already-discovered species. This is true for most types of animals, Mendez says. Across the board, "we're adding many more species by looking at genetic data."

The discovery of cryptic species will almost certainly increase the number of some organisms. In the case of ancient human ancestors, however, researchers now suspect that they've been too quick to name new species. An extremely well-preserved, approximately 1.8-million-year-old *Homo erectus* skull discovered in Georgia alerted scientists to the potential revision. The skull's odd proportions prompted researchers to analyze variation among modern human and chimpanzee skulls. The researchers then compared those variations with other known human ancestor species.

As the Guardian reports: They concluded that the variation among the skulls was smaller than they originally thought. Rather than being separate species, the human ancestors found in Africa from the same period may simply be normal variants of *H. erectus*, the first beings to have bodies like modern humans.

If the scientists are right, it would trim the base of the human evolutionary tree and spell the end for species names such as *H. rudolfensis*, *H. gautengensis*, *H. ergaster* and possibly *H. habilis*.

It's Hard To Tell Species Apart

Ancient humans, of course, are no longer around for scientists to study their behaviors and mating tendencies, so anatomy has to do. For now, researchers are calling for more specimens to determine where the line that marks a different species will fall.

The line distinguishing two species may be a fuzzy one, but in the case of the dolphins, it is a big deal in terms of conservation. Australia, for example, is planning to design protective legislation for its new dolphin species. Mendez hopes other countries will do the same.

Nonetheless, pondering the formation of new species in light of these two findings raises lots of questions. Are scientists subdividing genetic information and brain cavity size to group and regroup animals, or is there vast genetic diversity in even familiar species that they've yet to uncover? What does it mean for a species to gain or lose members of its family tree? The world and its creatures await more research.

Quiz

1 Which of the following sentences from the article would be MOST important to include in a summary of the article?

- (A) New species of insects, worms and other creepy-crawlers are announced on a monthly basis.
- (B) While the humpback dolphins look quite similar, their genetics tells a different story.
- (C) The line between what makes a species, a sub-species and a population is a blurry one.
- (D) Dolphins, Mendez and his partners are finding, evolve relatively quickly once isolated from parent populations.

2 The central idea of the article is developed by:

- (A) describing the research on new dolphin species and ancient human ancestors
- (B) comparing the evolution of dolphins to the evolution of humans
- (C) evaluating some of the different definitions of species used by scientists
- (D) explaining how designating new species affects laws for conservation

3 Read the sentence from the section "DNA Tells A Different Story."

In this case, though, the researchers are confident that the four dolphins are different enough to warrant the "species" title.

The author uses the word "warrant" to mean:

- (A) justify
- (B) excuse
- (C) dispute
- (D) explain

Read the following text selection from the section "DNA Tells A Different Story."

The DNA turned up genetic differences distinct enough to signal a separate species, and likewise, differences in the dolphins' skulls supported the divergence.

Which of the following words from the article provide context clues to the meaning of the word "divergence"?

- (A) genetic
- (B) distinct
- (C) species
- (D) likewise

Answer Key

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